WHOI-72-56

GRAVITY OBSERVATIONS 09.0°E TO 37.9°W. ALONG THE EQUATOR

by

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TECHNICAL REPORT

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Ferris Webster, Chairman
Department of Physical Oceanography

ABSTRACT

This report presents free air gravity values and computed free air anomalies obtained on an equatorial traverse from 09°00'E. to 37°56'W. It is the second of a series of reports presenting the gravity data to be used in deriving a "ground truth" calibration grid for comparison with topographical details of the world oceans obtained by a radar altimeter in an earth satellite scheduled to fly in 1974. A previous report (WHOI Technical Report #71-68) gave similar values taken on a traverse along the 150°W. meridian from 62.9°S. to 57.5° N.

INTRODUCTION

An orbiting satellite carrying a radar altimeter operating over the world oceans will provide a topographic map of the sea surface over wide selected areas and in time series. With such rapid, cyclic and far-ranging mapping of the ocean surface configuration, it is possible that changes in the sea and unexpected phenomena may be revealed which up to now remain undetected by conventional methods. NASA has altered the payload and orbit of the GEOS-C geodetic satellite now scheduled to fly in 1974 to accomodate the first of such oceanographic experiments.

To provide check points and calibration data for comparison with the values measured by orbiting altimeter, this WHOI/ONR project has concerned itself with measurement of a "ground truth" grid of gravity values and subsequent determination of the topography of the geoid along preselected traverses which eventually will comprise a grid which must be crossed at frequent intervals by the satellite. WHOI Reference #71-68, "Hudson '70 Gravity Observations 62.9°S.-57.5°N. Along 150°W.", presented data from the North South Pacific profile (von Arx, W. S., D. C. Bowen, J. P. Dean, R. T. Haworth, 1971).

The gravity data contained in this report were taken during a gravimetric arc run by the RV Atlantis II in the early summer of 1971 from Luanda to Trinidad along the equator from 09°00'E. to 37°56'W. (See Figure 1) The results of this cruise will be used with values obtained in the

Indian and Pacific Oceans by RV Chain in 1971 to complete the equatorial belt portion of the planned "ground truth" grid.

The magnitude of gravity at the sea surface was measured with the Ambac D4e VSA gravimeter installed on the Sperry Mark 19 gyrocompass stable platform. The drift of the meter was found to be -0.1 mgl./day, and this correction was applied to the observed gravity values. A Magnavox CA-706 Satellite Navigation receiver was used to determine the Eötvös correction by interpolation and close control of the ship speed and heading between fixes.

Table I contains the free air gravity values obtained by applying the Eötvös and gravimeter drift corrections to the observed gravity readings.

Table II is the free air anomaly values with reference to the 1930 International Formula gravity values. (negative values in italics).

Table III is the free air anomaly values with reference to the 1964 formula adopted by the IAU. (Negative values in italics).

Figure 2 is a graphic representation of the gravity profile obtained on this equatorial arc averaged over 1 degree, the 1930 and 1964 standard earths, and the 1970 gravity values derived by the Smithsonian Astrophysical Observatory from satellite data.

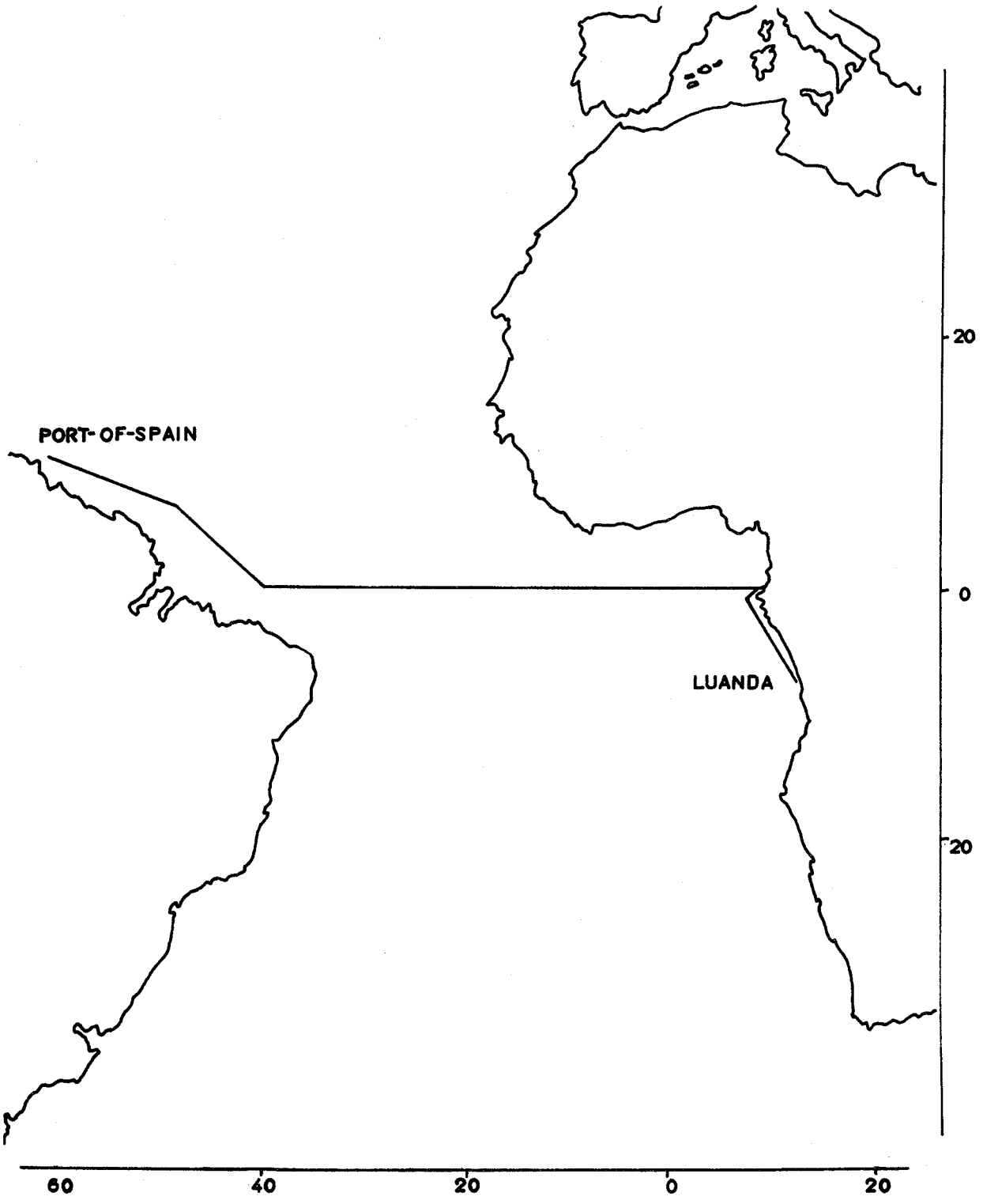

FIGURE 1. ATLANTIS II 60 LEG 6

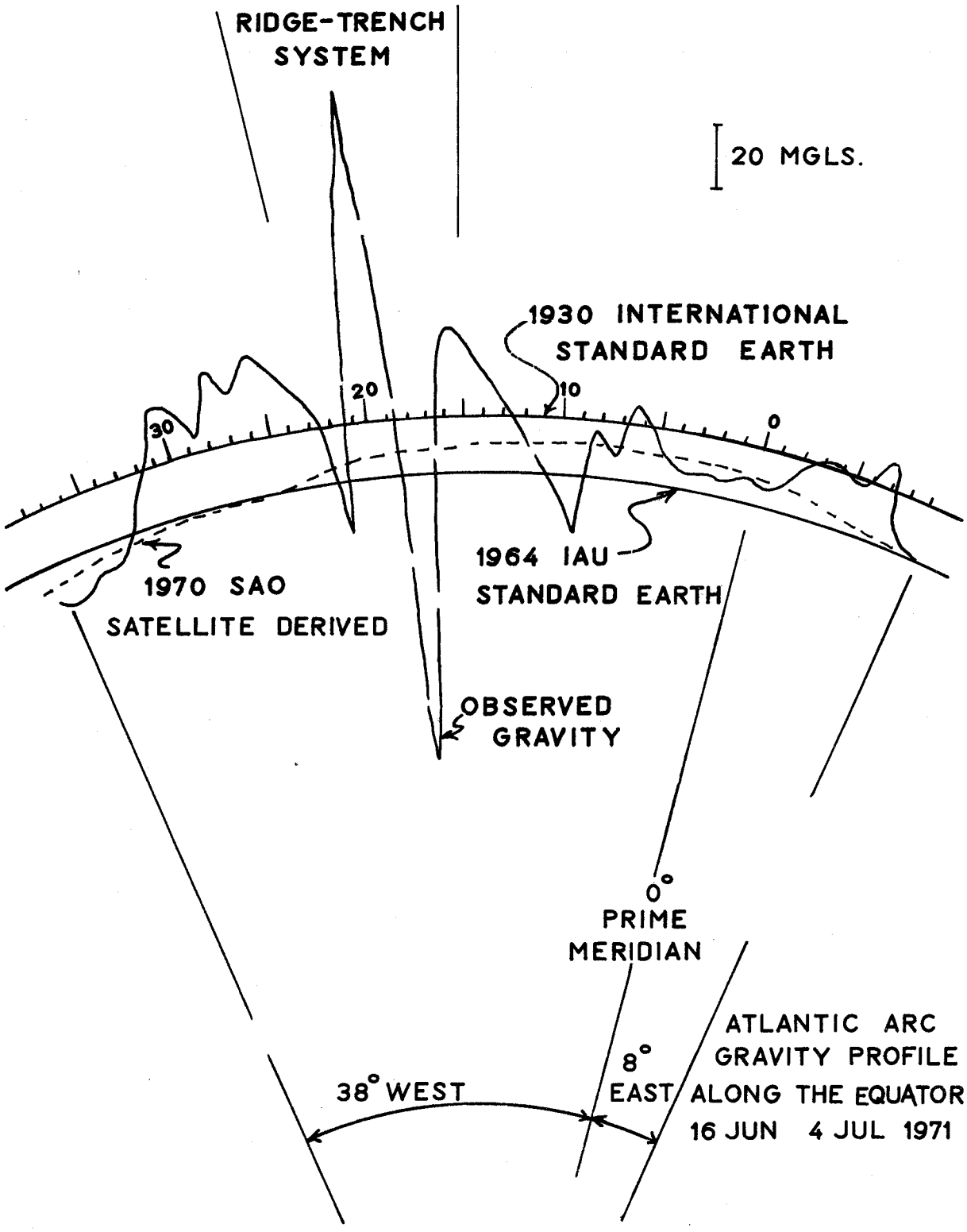
RIDGE-TRENCH SYSTEM
20 MGLS.
1930 INTERNATIONAL STANDARD EARTH
30
20
10
0
1970 SAO SATELLITE DERIVED
1964 IAU STANDARD EARTH
OBSERVED GRAVITY
0° PRIME MERIDIAN
38° WEST
8° EAST
ATLANTIC ARC GRAVITY PROFILE ALONG THE EQUATOR
16 JUN 4 JUL 1971

FIGURE 2.

Table I

TABLE I

Gravity at Sea Level for each Minute of Longitude
0° Latitude

φ	E	0	1	2	3	4	5	6	7	8	9
00°	00'	978.036	.337	.036	.036	.037	.038	.037	.037	.036	.038
	10	.039	.039	.040	.040	.039	.040	.039	.039	.038	.036
	20	.034	.032	.031	.032	.032	.033	.032	.032	.032	.034
	30	.034	.035	.035	.035	.036	.037	.039	.038	.039	.039
	40	.040	.039	.038	.039	.041	.042	.042	.042	.042	.040
	50	.040	.039	.039	.038	.038	.038	.038	.037	.038	.038
01	00	.039	.039	.039	.039	.039	.041	.040	.041	.041	.040
	10	.040	.039	.040	.040	.039	.039	.040	.039	.039	.038
	20	.038	.037	.036	.036	.034	.033	.032	.032	.032	.031
	30	.031	.034	.038	.042	.050	.059	.069	.074	.076	.073
	40	.065	.057	.049	.044	.040	.038	.037	.036	.036	.037
	50	.036	.037	.037	.037	.038	.038	.038	.040	.040	.039
02	00	.040	.041	.042	.043	.042	.043	.043	.044	.042	.043
	10	.043	.043	.044	.044	.042	.043	.043	.045	.046	.051
	20	.057	.063	.074	.083	.088	.082	.074	.062	.056	.051
	30	.047	.044	.044	.044	.045	.045	.047	.047	.048	.048
	40	.049	.050	.050	.050	.051	.050	.051	.051	.051	.053
	50	.054	.054	.054	.054	.054	.054	.056	.056	.055	.057
03	00	.056	.057	.058	.056	.056	.057	.056	.056	.058	.056
	10	.057	.057	.056	.057	.054	.054	.054	.054	.054	.053
	20	.052	.052	.050	.051	.052	.052	.051	.050	.050	.050
	30	.050	.050	.049	.050	.049	.049	.048	.048	.046	.044
	40	.043	.044	.046	.044	.042	.043	.043	.044	.044	.041
	50	.042	.042	.043	.044	.045	.048	.049	.051	.052	.056
04	00	.057	.058	.059	.058	.057	.057	.056	.055	.054	.053
	10	.052	.051	.050	.050	.049	.049	.048	.048	.048	.046
	20	.046	.046	.045	.043	.045	.045	.046	.046	.047	.048
	30	.047	.049	.049	.050	.050	.049	.049	.049	.051	.051
	40	.051	.050	.049	.048	.047	.047	.047	.047	.047	.047
	50	.049	.050	.051	.050	.052	.052	.051	.052	.053	.052

05	00	.052	.052	.053	.053†	.053†	.054†	.054†	.054	.055	.055
	10	.057	.056	.055	.055	.056	.054	.055	.052	.053	.053
	20	.053	.052	.052	.052	.052	.052	.052	.051	.050	.049
	30	.048	.047	.045	.044	.043	.041	.041	.040	.039	.037
	40	.038	.039	.038	.039	.040	.040	.040	.039	.042	.043
	50	.045	.047	.046	.045	.045	.045	.045	.046	.047	.048
06	00	.050	.051	.052	.056	.054	.057	.059	.059	.060	.063
	10	.065	.067	.069	.069						
	50	.076	.070	.064	.059	.054	.047	.045	.042	.041	.030
07	00	.031	.031	.032	.032	.034	.034	.035	.034	.037	.036
	10	.037	.038	.037	.037	.039	.040	.040	.040	.041	.042
	20	.042	.043	.043	.043	.044	.045	.046	.045	.044	.043
	30	.044	.044	.045	.045	.046	.044	.044	.043	.041	.041
	40	.040	.039	.037	.034	.033	.035	.033	.032	.031	.030
	50	.029	.032	.030	.031	.031	.034	.034	.035	.039	.038
08	00	.041	.042	.044	.044	.043	.044	.047	.048	.050	.053
	10	.053	.054	.054	.053	.052	.051	.050	.048	.045	.044
	20	.044	.042	.039	.038	.038	.038	.038	.039	.040	.041
	30	.041	.041	.036	.031	.026	.025	.023	.020	.018	.016
	40	.014	.012	.011	.011	.013	.012	.012	.015	.016	.015
	50	.015	.017	.018	.024	.026	.027	.027	.029	.030	.033
09	00	.036	.041	.044	.044	.046					

TABLE I (Continued)

φ	W	0	1	2	3	4	5	6	7	8	9
00°	00'	978.036	.034	.034	.035	.036	.037	.037	.038	.038	.039
	10	.039	.041	.040	.041	.041	.041	.042	.042	.040	.044
	20	.044	.043	.042	.040	.040	.037	.038	.038	.040	.038
	30	.036	.035	.036	.036	.036	.039	.038	.040	.042	.044
	40	.045	.046	.047	.048	.047	.046	.045	.046	.047	.046
	50	.046	.045	.047	.044	.045	.046	.044	.044	.046	.043
01	00	.044	.042	.043	.044	.044	.043	.041	.040	.039	.038
	10	.038	.037	.037	.036	.036	.039	.036	.038	.036	.037
	20	.035	.038	.036	.035	.037	.034	.032	.032	.032	.032
	30	.029	.029	.028	.030	.029	.030	.030	.033	.034	.034
	40	.034	.033	.033	.033	.034	.034	.033	.034	.035	.035
	50	.036	.036	.037	.037	.036	.034	.034	.034	.034	.037
02	00	.037	.037	.036	.037	.037	.037	.038	.041	.042	.041
	10	.041	.041	.041	.042	.041	.040	.039	.038	.038	.037
	20	.037	.038	.036	.037	.037	.036	.035	.036	.037	.037
	30	.037	.039	.040	.040	.041	.040	.041	.041	.042	.040
	40	.038	.039	.038	.038	.039	.037	.037	.036	.036	.036
	50	.035	.037	.039	.039	.040	.039	.041	.038	.039	.038
03	00	.039	.038	.038	.037	.038	.038	.037	.038	.038	.038
	10	.039	.037	.037	.037	.036	.036	.036	.035	.035	.036
	20	.036	.037	.035	.035	.036	.036	.037	.038	.038	.041
	30	.040	.039	.040	.040	.040	.039	.039	.039	.038	.038
	40	.038	.037	.037	.037	.036	.036	.035	.036	.035	.034
	50	.035	.036	.035	.035	.033	.034	.033	.032	.033	.033
04	00	.032	.033	.035	.037	.038	.038	.038	.037	.036	.035
	10	.036	.036	.036	.036	.038	.038	.039	.040	.042	.044
	20	.046	.047	.048	.049	.050	.053	.052	.052	.048	.046
	30	.045	.044	.044	.042	.043	.042	.043	.041	.040	.039
	40	.038	.037	.038	.036	.035	.036	.035	.034	.035	.036
	50	.039	.038	.038	.038	.038	.038	.039	.042	.045	.045

05	00	.047	.045	.045	.047	.044	.044	.044	.043	.042	.040
	10	.040	.039	.041	.039	.040	.040	.041	.042	.043	.043
	20	.043	.044	.047	.047	.048	.049	.050	.049	.049	.051
	30	.052	.051	.051	.050	.049	.049	.048	.047	.049	.049
	40	.051	.053	.054	.054	.055	.054	.052	.051	.050	.049
	50	.050	.052	.052	.054	.055	.055	.053	.054	.053	.054
06	00	.054	.055	.056	.056	.058	.057	.059	.059	.057	.057
	10	.057	.059	.061	.064	.064	.064	.061	.058	.057	.055
	20	.057	.058	.059	.058	.059	.057	.055	.054	.053	.051
	30	.050	.050	.051	.051	.051	.051	.051	.053	.054	.055
	40	.056	.056	.060	.061	.063	.064	.065	.064	.061	.054
	50	.049	.045	.042	.039	.037	.037	.038	.038	.038	.039
07	00	.039	.039	.040	.039	.038	.037	.036	.036	.037	.037
	10	.038	.041	.043	.046	.048	.046	.045	.043	.042	.042
	20	.044	.045	.045	.045	.045	.045	.045	.043	.044	.043
	30	.042	.044	.044	.043	.043	.044	.043	.043	.041	.041
	40	.041	.041	.041	.041	.041	.040	.040	.039	.034	.035
	50	.033	.032	.030	.030	.028	.027	.027	.025	.025	.027
08	00	.028	.028	.028	.030	.030	.031	.030	.030	.031	.032
	10	.035	.040	.046	.053	.059	.065	.068	.070	.068	.065
	20	.061	.058	.055	.054	.054	.054	.054	.054	.054	.053
	30	.052	.050	.049	.047	.046	.047	.048	.048	.049	.051
	40	.051	.051	.051	.049	.048	.049	.049	.049	.048	.046
	50	.046	.045	.043	.043	.045	.047	.050	.052	.053	.054
09	00	.054	.052	.048	.045	.041	.037	.034	.033	.032	.031
	10	.029	.028	.028	.026	.025	.023	.020	.019	.018	.016
	20	978.015	.013	.011	.010	.010	.011	.010	.009	.008	.007
	30	977.**7	.**6	.**6	.**4	.**2	.***	.**2	.**1	.**1	.999
	40	.997	.998	.998	.999	.***	.**1	.***	.***	.998	.997
	50	.995	.993	.993	.996	.997	.997	.999	.***	.**3	.**5

TABLE I (Continued)

ϕ	W	0	1	2	3	4	5	6	7	8	9
10°	00'	977.009	.010	.010	.008	.007	.007	.006	.006	.006	.005
	10	.004	.004	.005	.004	.004	.005	.007	.009	.012	.015
	20	.017	.018	.020	.021	.022	.025	.030	.035	.039	.044
	30	.048	.052	.054	.054	.055	.055	.056	.058	.062	.063
	40	.061	.058	.054	.051	.049	.047	.046	.046	.047	.047
	50	.048	.047	.044	.042	.040	.040	.041	.042	.043	.045
11	00	.045	.045	.044	.042	.041	.039	.041	.041	.043	.042
	10	.041	.039	.038	.039	.039	.038	.040	.041	.041	.039
	20	.040	.041	.043	.045	.049	.052	.056	.059	.056	.054
	30	.053	.053	.055	.057	.058	.058	.056	.053	.051	.048
	40	.045	.044	.044	.044	.045	.045	.047	.047	.046	.045
	50	.046	.046	.046	.047	.046	.046	.045	.045	.046	.048
12	00	.049	.051	.053	.054	.053	.056	.054	.052	.048	.045
	10	.043	.043	.045	.049	.051	.052	.054	.054	.054	.053
	20	.052	.051	.052	.054	.055	.055	.054	.050	.049	.049
	30	.050	.051	.053	.053	.050	.046	.043	.043	.045	.045
	40	.045	.044	.044	.044	.046	.048	.049	.049	.049	.047
	50	.046	.047	.050	.052	.057	.061	.061	.060	.057	.054
13	00	.051	.050	.050	.050	.051	.052	.051	.050	.049	.051
	10	.051	.054	.057	.059	.062	.063	.063	.063	.063	.062
	20	.061	.061	.060	.059	.056	.053	.052	.050	.050	.051
	30	.054	.056	.058	.060	.061	.061	.060	.058	.055	.055
	40	.052	.054	.055	.058	.060	.062	.063	.064	.063	.060
	50	.059	.058	.058	.059	.062	.065	.066	.067	.065	.063
14	00	.064	.066	.063	.060	.058	.056	.056	.060	.063	.066
	10	.070	.073	.075	.073	.069	.064	.061	.059	.058	.057
	20	.060	.062	.065	.068	.069	.068	.066	.066	.067	.069
	30	.072	.072	.070	.064	.059	.054	.053	.056	.062	.069
	40	.076	.082	.084	.087	.083	.078	.072	.067	.063	.061
	50	.061	.063	.067	.073	.080	.084	.084	.081	.075	.071

15	00	.069	.067	.068	.066	.065	.064	.066	.068	.071	.073
	10	.074	.075	.075	.077	.079	.080	.081	.081	.079	.076
	20	.073	.072	.076	.079	.082	.083	.082	.078	.076	.072
	30	.071	.070	.070	.069	.068	.069	.072	.077	.080	.083
	40	.083	.082	.081	.080	.078	.078	.076	.077	.080	.085
	50	.092	.100	.104	.106	.104	.103	.101	.098	.095	.093
16	00	.091	.090	.089	.087	.086	.085	.088	.091	.093	.095
	10	.096	.096	.095	.092	.091	.092	.094	.095	.095	.094
	20	.093	.092	.091	.091	.089	.086	.081	.076	.072	.067
	30	.065	.062	.061	.062	.063	.063	.062	.061	.060	.059
	40	978.055	.052	.049	.045	.043	.043	.043	.041	.041	.040
	50	977.*41	.*41	.*41	.*39	.*35	.*27	.*21	.**7	.993	.982
17	00	.974	.969	.965	.964	.964	.965	.967	.970	.971	.973
	10	.972	.968	.963	.960	.956	.955	.955	.956	.958	.959
	20	.960	.959	.958	.956	.953	.949	.947	.945	.943	.942
	30	.941	.940	.939	.937	.936	.935	.934	.932	.931	.930
	40	.929	.929	.927	.928	.928	.927	.927	.928	.928	.929
	50	.930	.033	.035	.936	.938	.938	.939	.941	.941	.942
18	00	.944	.947	.950	.952	.957	.961	.967	.972	.978	.984
	10	977.990	.**8†	.*26†	.*43†	.*61	.*69	.*75	.*83	.*87	.*90
	20	978.094	.096	.097	.099	.101	.102	.100	.098	.096	.095
	30	.094	.093	.094	.093	.090	.089	.087	.087	.084	.083
	40	.084	.084	.082	.083	.083	.083	.082	.082	.080	.079
	50	.079	.081	.081	.081	.081	.079	.077	.075	.071	.073
19	00	.070	.068	.069	.072	.072	.074	.076	.078	.081	.081
	10	.083	.084	.084	.085	.086	.087	.090	.088	.089	.092
	20	.094	.097	.103	.108	.113	.119	.125	.136	.141	.142
	30	.140	.139	.135	.138	.145	.151	.157	.163	.170	.173
	40	.173	.170	.168	.165	.162	.159	.152	.148	.146	.145
	50	.144	.142	.140	.140	.142	.141	.143	.144	.145	.147

TABLE I (Continued)

φ	W	0	1	2	3	4	5	6	7	8	9
20°	00'	978.149	.150	.151	.153	.158	.162	.160	.158	.153	.148
	10	.150	.150	.152	.149	.146	.140	.140	.140	.143	.147
	20	.148	.149	.152	.151	.150	.151	.147	.146	.145	.142
	30	.142	.138	.133	.130	.127	.122	.117	.113	.105	.098
	40	.091	.085	.083	.079	.074	.070	.066	.064	.062	.059
	50	.058	.055	.052	.048	.043	.040	.037	.031	.029	.024
21	00	.023	.018	.016	.016	.014	.014	.011	.010	.010	.010
	10	.012	.016	.018	.020	.023	.024	.025	.026	.029	.029
	20	.027	.025	.020	.018	.013	.011	.007	.005	.004	.005
	30	.005	.007	.006	.008	.013	.014	.015	.018	.020	.021
	40	.023	.025	.026	.029	.030	.029	.029	.028	.027	.025
	50	.024	.021	.021	.023	.027	.033	.038	.042	.044	.047
22	00	.048	.048	.050	.050	.048	.044	.041	.042	.042	.044
	10	.048	.051	.051	.053	.053	.054	.051	.050	.050	.053
	20	.053	.054	.054	.053	.054	.055	.055	.055	.056	.057
	30	.057	.056	.056	.057	.057	.056	.058	.054	.054	.055
	40	.058	.061	.066	.068	.071	.071	.068	.067	.065	.067
	50	.067	.067	.065	.063	.060	.058	.056	.057	.058	.057
23	00	.056	.056	.055	.055	.055	.055	.054	.053	.056	.054
	10	.057	.057	.058	.058	.058	.058	.059	.059	.061	.063
	20	.063	.063	.063	.062	.061	.062	.061	.063	.063	.066
	30	.064	.067	.068	.070	.069	.066	.063	.060	.058	.057
	40	.058	.063	.060	.060	.060	.061	.067	.074	.076	.077
	50	.075	.074	.073	.073	.071	.074	.074	.072	.067	.066
24	00	.060	.057	.055	.055	.058	.060	.062	.064	.066	.064
	10	.063	.062	.061	.061	.060	.060	.060	.064	.067	.068
	20	.069	.069	.070	.071	.073	.076	.079	.082	.082	.082
	30	.082	.084	.088	.091	.092	.092	.090	.090	.090	.089
	40	.093	.095	.097	.096	.091	.084	.075	.067	.061	.056
	50	.050	.044	.037	.031	.028	.030	.035	.042	.053	.062

25	00	.070	.078	.083	.086	.087	.087	.087	.087	.090	.089
	10	.090	.089	.088	.088	.090	.091	.086	.081	.077	.077
	20	.076	.076	.076	.074	.072	.070	.070	.069	.068	.063
	30	.062	.057	.054	.053	.056	.058	.059	.063	.065	.070
	40	.075	.078	.080	.082	.082	.081	.081	.082	.084	.085
	50	.088	.086	.084	.083	.078	.073	.069	.065	.061	.059
26	00	.057	.056	.056	.059	.062	.066	.063	.062	.061	.063
	10	.066	.064	.063	.059	.056	.056	.057	.055	.058	.057
	20	.056	.056	.054	.054	.054	.055	.059	.060	.063	.067
	30	.071	.073	.072	.072	.070	.071	.070	.069	.071	.072
	40	.073	.073	.073	.069	.069	.069	.071	.073	.074	.076
	50	.080	.083	.083	.084	.083	.083	.081	.080	.079	.079
27	00	.081	.081	.081	.080	.080	.078	.078	.076	.076	.079
	10	.078	.080	.082	.083	.082	.084	.084	.086	.087	.089
	20	.088	.085	.079	.078	.078	.075	.077	.078	.077	.073
	30	.068	.063	.063	.064	.063	.065	.066	.065	.068	.068
	40	.069	.068	.069	.070	.073	.073	.073	.071	.068	.063
	50	.061	.060	.063	.065	.063	.061	.061	.061	.059	.057
28	00	.056	.055	.055	.054	.054	.055	.055	.055	.056	.054
	10	.052	.052	.051	.052	.052	.053	.056	.055	.056	.057
	20	.057	.056	.054	.054	.053	.053	.056	.056	.056	.056
	30	.055	.054	.054	.054	.054	.052	.052	.052	.053	.055
	40	.057	.058	.057	.058	.059	.061	.067	.067	.064	.059
	50	.057	.057	.055	.056	.057	.062	.069	.075	.078	.078
29	00	.078	.072	.063	.056	.049	.049	.049	.052	.055	.060
	10	.065	.068	.071	.074	.075	.077	.079	.079	.078	.077
	20	.074	.073	.071	.068	.065	.063	.062	.064	.064	.062
	30	.061	.056	.057	.056	.059	.062	.062	.061	.063	.065
	40	.066	.067	.067	.065	.061	.058	.056	.055	.057	.056
	50	.056	.058	.058	.059	.059	.061	.061	.062	.060	.061

TABLE I (Continued)

ϕ	W	0	1	2	3	4	5	6	7	8	9
30°	00'	978.058	.059	.059	.058	.057	.055	.056	.052	.049	.048
	10	.046	.047	.049	.053	.057	.060	.063	.066	.062	.060
	20	.054	.052	.056	.059	.065	.067	.069	.070	.071	.071
	30	.068	.069	.069	.073	.077	.085	.095	.107	.120	.132
	40	.130	.115	.100	.090	.082	.073	.065	.063	.057	.055
	50	.056	.057	.060	.063	.062	.061	.060	.060	.062	.060
31	00	.061	.055	.053	.049	.048	.048	.044	.048	.049	.051
	10	.055	.055	.058	.062	.062	.061	.056	.053	.051	.049
	20	.049	.051	.053	.055	.057	.059	.058	.059	.056	.055
	30	.052	.052	.052	.049	.049	.049	.049	.053	.058	.060
	40	.064	.064	.062	.059	.057	.053	.050	.046	.042	.040
	50	.038	.038	.038	.039	.043	.048	.051	.056	.059	.059
32	00	.059	.059	.060	.058	.054	.053	.054	.053	.054	.054
	10	.053	.054	.053	.054	.054	.052	.052	.051	.048	.044
	20	.044	.042	.039	.037	.037	.038	.037	.036	.036	.036
	30	.037	.037	.037	.037	.040	.040	.037	.037	.038	.036
	40	.037	.037	.036	.037	.034	.034	.033	.031	.032	.032
	50	.033	.035	.036	.035	.035	.034	.034	.034	.035	.036
33	00	.035	.037	.037	.036	.036	.035	.036	.034	.034	.033
	10	.032	.031	.031	.028	.028	.028	.027	.026	.027	.027
	20	.028	.029	.029	.029	.031	.030	.030	.030	.028	.027
	30	.028	.027	.028	.029	.029	.030	.030	.031	.031	.033
	40	.033	.034	.033	.031	.030	.029	.027	.026	.024	.022
	50	.022	.020	.019	.019	.020	.019	.019	.019	.020	.020
34	00	.019	.018	.018	.018	.018	.019	.019	.020	.024	.019
	10	.021	.021	.019	.020	.017	.014	.013	.013	.014	.016
	20	.016	.018	.020	.021	.021	.022	.021	.023	.022	.022
	30	.023	.024	.024	.026	.025	.027	.026	.026	.029	.028
	40	.028	.029	.029	.029	.030	.028	.030	.029	.029	.031
	50	.029	.028	.028	.027	.027	.028	.027	.026	.027	.026

35	00	.026	.028	.029	.029	.028	.025	.023	.026	.024	.025
	10	.026	.028	.029	.030	.031	.030	.028	.026	.024	.023
	20	.023	.023	.025	.025	.025	.028	.031	.027	.028	.024
	30	.025	.024	.028	.027	.026	.025	.023	.023	.025	.024
	40	.025	.024	.022	.023	.025	.026	.026	.021	.022	.024
	50	.024	.023	.023	.022	.021	.020	.023	.024	.021	.021
36	00	.021	.020	.022	.023	.022	.023	.020	.017	.017	.016
	10	.016	.015	.014	.014	.012	.015	.015	.014	.013	.014
	20	.014	.015	.016	.016	.020	.018	.017	.016	.018	.016
	30	.020	.016	.019	.016	.016	.016	.015	.018	.017	.016
	40	.017	.017	.018	.020	.020	.018	.020	.017	.019	.017
	50	.016	.016	.014	.017	.016	.018	.019	.019	.018	.016
37	00	.020	.018	.019	.020	.020	.019	.021	.020	.020	.021
	10	.021	.022	.021	.021	.021	.019	.019	.019	.021	.018
	20	.021	.020	.020	.019	.018	.020	.020	.020	.019	.019
	30	.017	.019	.019	.022	.019	.017	.016	.017	.018	.017
	40	.017	.019	.018	.014	.016	.017	.016	.015	.017	.017
	50	.019	.019	.018	.018	.019	.020	.020			

Table II

TABLE II

Free Air Gravity Anomaly at Sea Level for each Minute of Longitude with reference to the International Formula (1930).
0° Latitude (Negative values in italics)

φ E	0	1	2	3	4	5	6	7	8	9
00°00'	*13*	*12*	*13*	*13*	*12*	*11*	*12*	*12*	*13*	*11*
10	*10*	*10*	*09*	*09*	*10*	*09*	*10*	*10*	*11*	*13*
20	*15*	*17*	*18*	*17*	*17*	*16*	*17*	*17*	*17*	*15*
30	*15*	*14*	*14*	*14*	*13*	*12*	*10*	*11*	*10*	*10*
40	*09*	*10*	*11*	*10*	*08*	*07*	*07*	*07*	*07*	*09*
50	*09*	*10*	*10*	*11*	*11*	*11*	*11*	*12*	*11*	*11*
01 00	*10*	*10*	*10*	*10*	*10*	*08*	*09*	*08*	*08*	*09*
10	*09*	*10*	*09*	*09*	*10*	*10*	*09*	*10*	*10*	*11*
20	*11*	*12*	*13*	*13*	*15*	*16*	*17*	*17*	*17*	*18*
30	*18*	*15*	*11*	*07*	01	10	20	25	27	24
40	16	08	*00*	*05*	*09*	*11*	*12*	*13*	*13*	*12*
50	*13*	*12*	*12*	*12*	*11*	*11*	*11*	*09*	*09*	*10*
02 00	*09*	*08*	*07*	*06*	*07*	*06*	*06*	*05*	*07*	*06*
10	*06*	*06*	*05*	*05*	*07*	*06*	*06*	*04*	*03*	02
20	08	14	25	34	39	33	25	13	07	02
30	*02*	01	01	01	00	00	*02*	*02*	*01*	*01*
40	*00*	01	01	01	02	01	02	02	02	04
50	05	05	05	05	05	05	07	07	06	08
03 00	07	08	09	07	07	08	07	07	09	07
10	08	08	07	08	05	05	05	05	05	04
20	03	03	01	02	03	03	02	01	01	01
30	01	01	00	01	00	00	*01*	*01*	*03*	*05*
40	*06*	*05*	*03*	*05*	*07*	*06*	*06*	*05*	*05*	*08*
50	*07*	*07*	*06*	*05*	*04*	*01*	*00*	02	03	07
04 00	08	09	10	09	08	08	07	06	05	04
10	03	02	01	01	00	00	*01*	*01*	*01*	*03*
20	*03*	*03*	*04*	*06*	*04*	*04*	*03*	*03*	*02*	*01*
30	*02*	*00*	*00*	01	01	*00*	*00*	*00*	02	02
40	02	01	00	*01*	*02*	*02*	*02*	*02*	*02*	*02*
50	00	01	02	01	03	03	02	03	04	03

05	00	03	03	04	04†	04†	05†	05†	05	06	06
	10	08	07	06	06	07	05	06	03	04	04
	20	04	03	03	03	03	03	03	02	01	00
	30	*01*	*01*	*04*	*05*	*06*	*08*	*08*	*09*	*10*	*12*
	40	*11*	*10*	*11*	*10*	*09*	*09*	*09*	*10*	*07*	*06*
	50	*04*	*02*	*03*	*04*	*04*	*04*	*04*	*03*	*02*	*01*
06	00	01	02	03	07	05	08	10	10	11	15
	10	16	18	20	20						
	20										
	30										
	40										
	50	27	21	15	10	05	*02*	*05*	*07*	*08*	*19*
07	00	*18*	*18*	*17*	*17*	*15*	*15*	*14*	*15*	*12*	*13*
	10	*12*	*11*	*12*	*12*	*10*	*09*	*09*	*09*	*08*	*07*
	20	*07*	*06*	*06*	*06*	*05*	*04*	*03*	*04*	*05*	*06*
	30	*05*	*05*	*04*	*04*	*03*	*05*	*05*	*06*	*08*	*08*
	40	*09*	*10*	*12*	*15*	*16*	*14*	*16*	*17*	*18*	*19*
	50	*20*	*17*	*19*	*18*	*18*	*15*	*15*	*14*	*10*	*11*
08	00	*08*	*07*	*05*	*05*	*06*	*05*	*02*	*01*	01	04
	10	04	05	05	04	03	02	01	*01*	*03*	*05*
	20	*05*	*07*	*10*	*11*	*11*	*11*	*11*	*10*	*09*	*08*
	30	*08*	*08*	*13*	*18*	*23*	*24*	*26*	*29*	*31*	*33*
	40	*35*	*37*	*38*	*38*	*36*	*37*	*37*	*34*	*33*	*34*
	50	*34*	*32*	*31*	*25*	*23*	*22*	*22*	*20*	*19*	*16*
09	00	*13*	*08*	*05*	*05*	*03*					

TABLE II (Continued)

φ W	0	1	2	3	4	5	6	7	8	9
00°00'	13	15	15	14	13	12	12	11	11	10
10	10	08	09	08	08	08	07	07	09	05
20	05	06	07	09	09	12	11	11	09	11
30	13	14	13	13	13	10	11	09	07	05
40	04	03	02	01	02	03	04	03	02	03
50	03	04	02	05	04	03	05	05	03	06
01 00	05	07	06	05	05	06	08	09	10	11
10	11	12	12	13	13	10	13	11	13	12
20	14	11	13	14	12	15	17	17	17	17
30	20	20	21	19	20	19	19	16	15	15
40	15	16	16	16	15	15	16	16	14	14
50	13	13	12	12	13	15	15	15	15	12
02 00	12	12	13	12	12	12	11	08	07	08
10	08	08	08	07	08	09	10	11	11	12
20	12	11	13	12	12	13	14	13	12	12
30	12	10	09	09	08	09	08	08	07	09
40	11	10	11	11	10	12	12	13	13	13
50	14	12	10	10	09	10	08	11	10	11
03 00	10	11	11	12	11	11	12	11	11	11
10	10	12	12	12	13	13	13	14	14	13
20	13	12	14	14	13	13	12	11	11	08
30	09	10	09	09	09	10	10	10	11	11
40	11	12	12	12	13	13	14	13	14	15
50	14	13	14	14	16	15	16	17	16	16
04 00	17	16	14	12	11	11	11	12	13	14
10	13	13	13	13	11	11	10	09	07	05
20	03	02	01	00	01	04	03	03	01	03
30	04	05	05	07	06	07	06	08	09	10
40	11	12	11	13	14	13	14	15	14	13
50	10	11	11	11	11	11	10	07	04	04

05	00	02	04	04	03	05	05	05	06	07	09
	10	09	10	08	10	09	09	08	07	06	06
	20	06	05	02	02	01	00	01	00	00	02
	30	03	02	02	01	00	00	01	02	00	00
	40	02	04	05	05	06	05	03	02	01	00
	50	01	03	03	05	06	06	04	05	04	05
06	00	05	06	07	07	09	08	10	10	08	08
	10	08	10	12	15	15	15	12	09	08	06
	20	08	09	10	09	10	08	06	05	04	02
	30	01	01	02	02	02	02	02	04	05	06
	40	07	07	11	12	14	15	16	16	12	05
	50	00	04	07	10	12	12	11	11	11	10
07	00	10	10	09	10	11	12	13	13	12	12
	10	11	08	06	03	01	03	04	06	07	07
	20	05	04	04	04	04	04	04	06	05	06
	30	07	05	05	06	06	05	06	06	08	08
	40	08	08	08	08	08	09	09	10	15	14
	50	16	17	19	19	21	22	22	24	24	22
08	00	21	21	21	19	19	18	19	19	18	17
	10	14	09	03	04	10	16	19	21	19	16
	20	12	09	06	05	05	05	05	05	05	04
	30	03	01	00	02	03	02	01	01	00	02
	40	02	02	02	00	01	00	00	00	01	03
	50	03	04	06	06	04	02	01	03	04	05
09	00	05	03	01	04	08	12	15	16	17	18
	10	20	21	21	23	24	26	29	30	31	33
	20	34	36	38	39	39	38	39	40	41	42
	30	42	43	43	45	47	49	47	48	48	50
	40	52	51	51	50	49	48	49	49	51	52
	50	54	56	56	53	52	52	50	49	46	44

TABLE II (Continued)

φ W	0	1	2	3	4	5	6	7	8	9
10°00'	40	39	39	41	42	42	43	43	43	44
10	45	45	44	45	45	44	42	40	37	34
20	32	31	29	28	27	24	19	14	10	05
30	01	03	05	05	06	06	07	09	13	14
40	12	09	05	02	00	02	03	03	02	02
50	01	02	05	07	09	09	08	07	06	04
11 00	04	04	05	07	08	10	08	08	06	07
10	08	10	11	10	10	11	09	08	08	10
20	09	08	06	04	00	03	07	10	07	05
30	04	04	06	08	09	09	07	04	02	01
40	04	05	05	05	04	04	02	02	03	04
50	03	03	03	02	03	03	04	04	03	01
12 00	00	02	04	05	06	07	05	03	01	04
10	06	06	04	00	02	03	05	05	05	04
20	03	02	03	05	06	06	05	01	00	00
30	01	02	04	04	01	03	06	06	04	04
40	04	05	05	05	03	01	00	00	00	02
50	03	02	01	03	08	12	12	11	08	05
13 00	02	01	01	01	02	03	02	01	00	02
10	02	05	08	10	13	14	14	14	14	13
20	12	12	11	10	07	04	03	01	01	02
30	05	07	09	11	12	12	11	09	06	06
40	03	05	06	09	11	13	14	15	14	11
50	10	09	09	10	13	16	17	18	16	14
14 00	15	17	14	11	09	07	07	11	14	17
10	21	24	26	24	20	15	12	10	09	08
20	11	13	16	19	20	19	17	17	18	20
30	23	23	21	15	10	05	04	07	13	20
40	27	33	35	38	34	29	23	18	14	12
50	12	14	18	24	31	35	35	32	26	22

15	00	20	18	19	17	16	15	17	19	22	24
	10	25	26	26	28	30	31	32	32	30	27
	20	24	23	27	30	33	34	33	29	27	23
	30	22	21	21	20	19	20	23	28	31	34
	40	34	33	32	31	29	29	27	28	31	36
	50	43	51	55	57	55	54	52	49	46	44
16	00	42	41	40	38	37	36	39	42	44	46
	10	47	47	46	43	42	43	45	46	46	45
	20	44	43	42	42	40	37	32	27	23	18
	30	16	13	12	13	14	14	13	12	11	10
	40	06	03	00	*04*	*06*	*06*	*06*	*08*	*08*	*09*
	50	*08*	*08*	*08*	*10*	*14*	*22*	*28*	*42*	*56*	*67*
17	00	*75*	*80*	*84*	*85*	*85*	*84*	*82*	*79*	*78*	*76*
	10	*77*	*81*	*86*	*89*	*93*	*94*	*94*	*93*	*91*	*90*
	20	*89*	*90*	*91*	*93*	*96*	*100*	*102*	*104*	*106*	*107*
	30	*108*	*109*	*110*	*112*	*113*	*114*	*115*	*117*	*118*	*119*
	40	*120*	*120*	*122*	*121*	*121*	*122*	*122*	*121*	*121*	*120*
	50	*119*	*117*	*114*	*113*	*111*	*111*	*110*	*108*	*108*	*107*
18	00	*105*	*102*	*99*	*97*	*92*	*88*	*82*	*77*	*71*	*65*
	10	*59*	*41*†	*23*†	*06*†	12	20	26	34	38	41
	20	45	47	48	50	52	53	51	49	47	46
	30	45	44	45	44	41	40	38	38	35	34
	40	35	35	33	34	34	34	33	33	31	30
	50	30	32	32	32	32	30	28	26	22	24
19	00	21	19	20	23	23	25	27	29	32	32
	10	34	35	35	36	37	38	41	39	40	43
	20	45	48	54	59	64	70	76	87	92	93
	30	91	90	86	89	96	102	108	114	121	124
	40	124	121	119	116	113	110	103	99	97	96
	50	95	93	91	91	93	92	94	95	96	98

TABLE II (Continued)

φ	W	0	1	2	3	4	5	6	7	8	9
20°	00	100	101	102	104	109	113	111	109	104	99
	10	101	101	103	100	97	91	91	91	94	98
	20	99	100	103	102	101	102	98	97	96	93
	30	93	89	84	81	78	73	68	64	57	49
	40	42	36	34	30	25	21	17	15	13	10
	50	09	06	03	*01*	*06*	*09*	*12*	*18*	*20*	*25*
21	00	*26*	*31*	*33*	*33*	*35*	*35*	*38*	*39*	*39*	*39*
	10	*37*	*33*	*31*	*29*	*26*	*25*	*24*	*23*	*20*	*20*
	20	*22*	*24*	*29*	*31*	*36*	*38*	*42*	*43*	*45*	*44*
	30	*43*	*42*	*43*	*41*	*36*	*35*	*34*	*31*	*29*	*28*
	40	*26*	*24*	*23*	*20*	*19*	*20*	*20*	*21*	*22*	*24*
	50	*25*	*28*	*28*	*26*	*22*	*16*	*11*	*07*	*05*	*03*
22	00	*01*	*01*	01	01	*01*	*05*	*08*	*07*	*07*	*05*
	10	*01*	02	02	04	04	05	02	01	01	04
	20	04	05	05	04	05	06	06	06	07	08
	30	08	07	07	08	08	07	09	05	05	06
	40	09	12	17	19	22	22	19	18	16	18
	50	18	18	16	14	11	09	07	08	09	08
23	00	07	07	06	06	06	06	05	04	07	05
	10	08	08	09	09	09	09	10	10	12	14
	20	14	14	14	13	12	13	12	14	14	17
	30	15	18	19	21	20	17	14	11	09	08
	40	09	14	11	11	11	12	18	25	27	28
	50	26	25	24	24	22	25	25	23	18	17
24	00	11	08	06	06	09	11	13	15	17	15
	10	14	13	12	12	11	11	11	15	18	19
	20	20	20	21	22	24	27	30	33	33	33
	30	33	35	39	42	43	43	41	41	41	40
	40	44	46	48	47	42	35	26	18	12	07
	50	01	*05*	*12*	*18*	*21*	*19*	*14*	*07*	04	13

25	00	21	29	34	37	38	38	38	38	41	40
	10	41	40	39	39	41	41	37	32	28	28
	20	27	27	27	25	23	21	21	20	19	14
	30	13	08	05	04	07	09	10	14	16	21
	40	26	29	31	33	33	32	32	33	35	36
	50	39	37	35	34	29	24	20	16	12	10
26	00	08	07	07	10	13	17	14	13	12	14
	10	17	15	14	10	07	07	08	06	09	08
	20	07	07	05	05	05	06	10	11	14	18
	30	22	24	23	23	21	22	21	20	22	23
	40	24	24	24	20	20	20	22	24	25	27
	50	31	34	34	35	34	34	32	31	30	30
27	00	32	32	32	31	31	29	29	27	27	30
	10	29	31	33	34	33	35	35	37	38	40
	20	39	36	30	29	29	26	28	29	28	24
	30	19	14	14	15	14	16	17	17	19	19
	40	20	19	20	21	24	24	24	22	19	14
	50	12	11	14	16	14	12	12	12	10	08
28	00	07	06	06	05	05	06	06	06	07	05
	10	03	03	02	03	03	04	07	06	07	08
	20	08	07	05	05	04	04	07	07	07	07
	30	06	05	05	05	05	03	03	03	04	06
	40	08	09	08	09	10	12	18	18	15	10
	50	08	08	06	07	08	13	20	26	29	29
29	00	29	23	14	07	00	00	00	03	06	11
	10	16	19	22	25	26	28	30	30	29	28
	20	25	24	22	19	16	14	13	15	15	13
	30	12	07	08	07	10	13	13	12	14	16
	40	17	18	18	16	12	09	07	06	08	07
	50	07	09	08	10	10	12	12	13	11	12

TABLE II (Continued)

φ	W	0	1	2	3	4	5	6	7	8	9
30°	00'	09	10	10	09	08	06	07	03	00	*01*
	10	*03*	*02*	*00*	04	08	11	14	17	13	11
	20	05	03	07	10	16	18	20	21	22	22
	30	19	20	20	24	28	36	46	58	71	83
	40	81	66	51	41	33	24	16	14	08	06
	50	07	08	11	14	13	12	11	11	13	11
31	00	12	06	04	00	*01*	*01*	*05*	*01*	*00*	02
	10	06	06	09	13	13	12	07	04	02	00
	20	00	02	04	06	08	10	09	10	07	06
	30	03	03	03	00	00	00	00	04	09	11
	40	15	15	13	10	08	04	01	*04*	*07*	*09*
	50	*11*	*11*	*11*	*10*	*06*	*01*	02	07	10	10
32	00	10	10	11	09	05	04	05	04	05	05
	10	04	05	04	05	05	03	03	02	*01*	*05*
	20	*05*	*07*	*10*	*12*	*12*	*11*	*12*	*13*	*13*	*13*
	30	*12*	*12*	*12*	*12*	*09*	*09*	*12*	*12*	*11*	*13*
	40	*12*	*12*	*13*	*12*	*15*	*15*	*16*	*18*	*17*	*17*
	50	*16*	*14*	*13*	*14*	*14*	*15*	*15*	*15*	*14*	*13*
33	00	*14*	*12*	*12*	*13*	*13*	*14*	*13*	*15*	*15*	*16*
	10	*17*	*18*	*18*	*21*	*21*	*21*	*22*	*23*	*22*	*22*
	20	*21*	*20*	*20*	*20*	*18*	*19*	*19*	*19*	*21*	*22*
	30	*21*	*22*	*21*	*20*	*20*	*19*	*19*	*18*	*18*	*16*
	40	*16*	*15*	*16*	*18*	*19*	*20*	*22*	*23*	*25*	*27*
	50	*27*	*29*	*30*	*30*	*29*	*30*	*30*	*30*	*29*	*29*
34	00	*30*	*31*	*31*	*31*	*31*	*30*	*30*	*29*	*25*	*30*
	10	*28*	*28*	*30*	*29*	*32*	*35*	*36*	*36*	*35*	*36*
	20	*33*	*31*	*29*	*28*	*28*	*27*	*28*	*26*	*27*	*27*
	30	*26*	*25*	*25*	*23*	*24*	*22*	*23*	*23*	*20*	*21*
	40	*21*	*20*	*20*	*20*	*19*	*21*	*19*	*20*	*20*	*18*
	50	*20*	*21*	*21*	*22*	*22*	*21*	*22*	*23*	*22*	*23*

35	00	23	21	20	20	21	23	26	23	25	24
	10	23	21	20	19	18	19	21	23	25	26
	20	26	26	24	24	24	21	18	22	21	25
	30	24	25	21	22	23	24	26	26	24	25
	40	24	25	27	26	24	23	23	28	27	25
	50	25	26	26	27	28	29	26	25	28	28
36	00	28	29	27	26	27	26	29	32	32	33
	10	33	34	35	35	37	34	34	35	36	35
	20	35	34	33	33	29	31	32	33	31	33
	30	29	33	30	33	33	33	34	31	32	33
	40	32	32	31	29	29	31	29	32	30	32
	50	33	33	35	32	33	31	30	30	31	33
37	00	29	31	30	29	29	30	28	29	29	28
	10	28	27	28	28	28	30	30	30	28	31
	20	28	29	29	30	31	29	29	29	30	30
	30	32	30	30	27	30	32	33	32	31	32
	40	32	30	31	35	33	32	33	34	32	32
	50	30	30	31	31	30	29	29			

Table III

TABLE III

Free Air Gravity Anomaly at Sea Level for each Minute of Longitude with reference to the IAU Formula (1964)
0° Latitude (Negative values in italics)

φ	E		
0°	04	6°	18
	05		27
	08		37
	06		
	00		
	02		
	07		
	06		
	10		
	06		22
1°	07	7°	*01*
	08		03
	08		05
	07		09
	02		12
	01		12
	37		12
	17		05
	04		*01*
	06		*01*
2°	08	8°	09
	11		15
	12		22
	14		13
	56		06
	15		09
	15		*09*
	18		*21*
	19		*16*
	22		*06*

3°	24	9°	04
	24		
	24		
	22		
	20		
	18		
	16		
	14		
	12		
	12		
4°	25		
	24		
	18		
	16		
	12		
	15		
	17		
	17		
	15		
	20		
5°	20		
	22†		
	23		
	21		
	20		
	16		
	09		
	06		
	10		
	13		

TABLE III (Continued)

φ	W								
0°	04	6°	22	12°	17	18°	*88*	24°	28
	05		27		22		*65*		30
	08		29		13		*06*†		29
	08		25		22		55		35
	08		27		23		69		41
	04		18		18		62		50
	06		19		11		55		58
	15		28		12		50		65
	15		29		17		48		29
	13		05		25		49		*04*
1°	12	7°	07	13°	19	19°	38	25°	38
	09		04		19		44		55
	05		11		25		52		56
	04		10		31		57		45
	05		13		24		81		40
	03		10		22		108		30
	02		11		28		125		27
	01		09		23		136		48
	03		02		31		114		52
	04		*04*		30		110		46
2°	05	8°	*04*	14°	32	20°	117	26°	25
	06		*02*		24		128		31
	09		14		43		120		31
	06		36		26		111		26
	05		22		37		118		22
	05		20		40		110		39
	09		16		21		85		38
	06		19		52		51		41
	04		16		31		30		42
	08		13		48		11		51

3°	07	9°	22	15°	37	21°	*10*	27°	49
	05		02		34		*21*		46
	05		*04*		43		*14*		50
	03		*14*		47		*03*		54
	04		*22*		50		*19*		46
	08		*25*		39		*27*		36
	07		*30*		40		*17*		34
	05		*34*		49		*06*		37
	03		*34*		48		*05*		36
	01		*35*		72		*05*		31
4°	00	10°	*23*	16°	59	22°	*10*	28°	24
	06		*26*		56		09		23
	04		*27*		63		19		19
	10		*20*		63		18		24
	18		*10*		57		22		21
	13		16		33		25		23
	11		24		30		26		20
	06		22		17		34		25
	03		15		09		33		32
	06		08		03		28		25
5°	15	11°	13	17°	*58*	23°	24	29°	46
	12		09		*65*		22		17
	09		06		*69*		26		39
	11		09		*74*		29		46
	16		17		*79*		29		33
	20		21		*91*		32		29
	16		24		*98*		31		30
	22		12		*105*		28		35
	18		14		*104*		44		25
	23		14		*94*		39		27

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This report presents free air gravity values and computed free air anomalies obtained on an equatorial traverse from 09°00'E. to 37°56'W. It is the second of a series of reports presenting the gravity data to be used in deriving a "ground truth" calibration grid for comparison with topographical details of the world oceans obtained by a radar altimeter in an earth satellite scheduled to fly in 1974. A previous report (WHOI Technical Report #71-68) gave similar values taken on a traverse along the 150°W. meridian from 62.9°S. to 57.5°N.

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